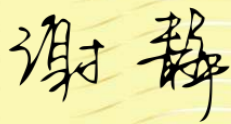



G59/3 TYPE TEST VERIFICATION REPORT

Type Tested reference number		GW3048-EM, GW3648-EM, GW5048-EM	
System supplier name		Jiangsu GoodWe Power Supply Technology Co.,Ltd.	
Address		NO.189 Kun Lun Shan Road, Suzhou New District, Jiangsu,china	
Tel	+86 512 6239 7998	Fax	+86 512 6239 7972
E:mail	service@goodwe.com.cn	Web site	http://www.goodwe.com.cn
Maximum export capacity, use separate sheet if more than one connection option.	3	kW single phase	
	3.68	kW single phase	
	5	kW single phase	
<p>System supplier declaration.</p> <p>- I certify on behalf of the company named above as a supplier of a Generating Unit, that all products supplied by the company with the above Type Test reference number will be manufactured and tested to ensure that they perform as stated in this document, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of G59/3.</p>			
Signed		On behalf of	

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

Generating Unit (rpp)		rating per phase	4.6	kVA	Harmonic % = Measured Value (Amps) x 23/rating per phase (kVA)	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-12	
	Measured Value MV in Amps	%	Measured Value MV in Amps	%	1 phase	3 phase
2	0.010	0.05%	0.005	0.03%	8%	8%
3	0.322	1.61%	0.317	1.59%	21.6%	Not stated
4	0.010	0.05%	0.011	0.06%	4%	4%
5	0.026	0.13%	0.019	0.10%	10.7%	10.7%
6	0.003	0.02%	0.003	0.02%	2.67%	2.67%
7	0.013	0.07%	0.011	0.06%	7.2%	7.2%
8	0.008	0.04%	0.005	0.03%	2%	2%
9	0.007	0.04%	0.009	0.05%	3.8%	Not stated
10	0.008	0.04%	0.006	0.03%	1.6%	1.6%
11	0.009	0.05%	0.009	0.05%	3.1%	3.1%
12	0.005	0.03%	0.006	0.03%	1.33%	1.33%
13	0.006	0.03%	0.005	0.03%	2%	2%
THD	0.362	1.81%	0.264	1.32%	23%	13%
PWHD	0.548	2.74%	0.538	2.69%	23%	22%

Power Quality. Voltage fluctuations and Flicker. The tests should be carried out on a single Generating Unit. Results should be normalised to a standard source impedance or if this results in figures above the limits set in BS EN 61000-3-11 to a suitable Maximum Impedance.

	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P st	P lt 2 hours
Measured Values at test impedance	-	-	-	-	-	-	-	-
Normalised to standard impedance	0.58%	0.31%	0.00%	0.85%	0.39%	0.30%	0.06	0.09
Normalised to required maximum impedance	-	-	-	-	-	-	-	-
Limits set under BS EN 61000-3-11	4%	3.3%	3.3%	4%	3.3%	3.3%	1.0	0.65
Test Impedance	R	-	Ω	XI	-	Ω		
Standard Impedance	R	0.4	Ω	XI	0.25	Ω		
Maximum Impedance	R	-	Ω	XI	-	Ω		

Power quality. DC injection.

Test power level	10%	55%	100%
Recorded value in Amps	0.041	0.036	0.018
as % of rated AC current	0.21%	0.18%	0.09%
Limit	0.25%	0.25%	0.25%

Power Quality. Power factor. The tests should be carried out on a single Generating Unit. Test are to be carried out at three voltage levels and at full output. Voltage to be maintained within + or – 1.5% of the stated level during the test.

	216.2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within + or – 1.5% of the stated level during the test.
Measured value	0.998	0.999	0.999	
Limit	>0.95	>0.95	>0.95	

Protection. Frequency tests

Function	Setting		Trip test		“No-trip tests”	
	Frequency	Time delay	Frequency	Time delay	Frequency /time	Confirm no trip
O/F stage 1	51.5Hz	90s	51.52Hz	90.4 s	51.3Hz 95s	no trip
O/F stage 2	52Hz	0.5s	52.01 Hz	872 ms	51.8Hz 89.98s/90.24	no trip
					52.2Hz 0.48s/892ms/ 902ms	no trip
U/F stage 1	47.5Hz	20s	47.49Hz	20.19s	47.7Hz 25s	no trip
U/F stage 2	47Hz	0.5s	47.00Hz	740.74 ms	47.2Hz 19.98s/20.23s	no trip
					46.8 Hz 0.48s/829ms/ 840ms	no trip

Protection. Voltage tests						
Function	Setting		Trip test		"No trip-tests" All phases at same voltage	
	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
O/V stage 1	262.2V	1.0s	262.21V	1.42 s	258.2V 2.0 sec	no trip
O/V stage 2	273.7V	0.5s	270.66 V	692.52 ms	269.7V/269.7 3 0.98s/1.456s	no trip
					277.7V/277.7 2 0.48s/960ms	no trip
U/V stage 1	200.1V	2.5s	198.79 V	2.95 s	204.1V 3.5s	no trip
U/V stage 2	184V	0.5s	182.36 V	940ms	188V/188.03 2.48s/2.92s	no trip
					180v/180.05 0.48 sec/948ms	no trip

Protection. Loss of Mains test and single phase test.						
Test Power and imbalance	33%	66%	100%	33%	66%	100%
	-5% Q	-5% Q	-5% P	+5% Q	+5% Q	+5% P
Trip time. Limit is 0.5s	340ms	330ms	276ms	260ms	258ms	298ms

Protection. Frequency change, Stability test				
	Start Frequency	Change	End Frequency	Confirm no trip
Positive Vector Shift	49.5Hz	+9 degrees		no trip
Negative Vector Shift	50.5Hz	- 9 degrees		no trip
Positive Frequency drift	49.5Hz	+0.19Hzs ⁻¹	51.5Hz	no trip
Negative Frequency drift	50.5Hz	-0.19Hzs ⁻¹	47.5Hz	no trip

Protection. Re-connection timer. The tests should prove that the reconnection sequence starts in no less than 20s for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1					
Test should prove that the reconnection sequence starts in no less than 20s for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1					
Time delay setting (s)	Measured delay (s)	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 10.5.7.1.			
20s	46.4s	At 266.2V	At 196.1V	At 47.4Hz	At 51.6Hz
Confirmation that the Generating Unit does not re-connect		no reconnection	no reconnection	no reconnection	no reconnection

Fault level contribution.					
For machines with electro-magnetic output			For Inverter output		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	---	20ms	-7.9V	1.2A
Initial Value of aperiodic current	A	---	100ms	-7.8V	-200mA
Initial symmetrical short-circuit current*	I_k	---	250ms	-7.5V	-200mA
symmetrical (aperiodic) component of short circuit current*	i_{DC}	---	500ms	-7.5V	-400mA
Reactance/Resistance Ratio of source*	X/R	---	Time to trip	63.6ms	

Self Monitoring solid state switching	NA
It has been verified that in the event of the solid state switching device failing to disconnect the Generating Unit, the voltage on the output side of the switching device is reduced to a value below 50 Volts within 0.5 seconds	

Additional comments
GW4248D-ES is similar to GW5048D-ES in circuit and construction except for output rating of current and power. The test result can refer to GW5048D-ES .